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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. |
|-----------------|-------------|----------------------|---------------------|
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09/199,829 11/25/98 SMITH

F TI-25250

023494 MMC1/0411
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EXAMINER

EATON, K

ART UNIT

PAPER NUMBER

2823

DATE MAILED:

04/11/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.

09/199,829

Applicant(s)

SMITH ET AL.

Examiner

Kurt M. Eaton

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 March 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-6 and 25-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-6 and 25-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 18) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other: _____

DETAILED ACTION

Declaration Under 37 CFR §1.131

1. The declaration filed on 3/22/01 under 37 CFR 1.131 is sufficient to overcome the Lin (U.S. Patent No. 5,893,748) reference.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.
3. Claims 1, 4-6, and 25-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Akram et al. in view of Irving.

In re claims 1, 25, and 29, Akram et al. (herein referred to as Akram) shows, in an analogous art related to fabrication multi chip modules, in Figures 1A-1D providing a semiconductor wafer (12) containing oxygen sensitive material; forming a layer of a first material (16) over the oxygen sensitive material; forming a photoresist layer (18) over the layer of the first material; patterning the layer of the first material; and removing all of the photoresist layer after patterning the layer of the first material using a "piranha" etch {column 4, line 55 - column 5, line 22}.

Akram does not show wherein the photoresist layer is removed using a downstream plasma process including hydrogen or deuterium and substantially no oxidizing component.

Irving teaches that photoresist may be removed from a substrate using a downstream plasma process including hydrogen or deuterium and substantially no oxidizing component. Irving further teaches wherein the aforementioned downstream plasma process is preferable compared to wet etch

type photoresist removal processes because photoresist wet etch removal solutions decompose rapidly and thus require frequent changes {column 2, line 15 – column 4, line 28}.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to remove the photoresist of Akram using the method as described by Irving since the “piranha” etch used in Akram is a well known photoresist wet etch removal solution that decomposes frequently and, as evidenced by Irving, the downstream plasma process of Irving is a well known photoresist removal method which can overcome the problems associated with wet etchant photoresist removal systems.

In re claims 25 and 29, Akram also shows wherein the layer of first material is oxygen sensitive material {column 4, line 55 - column 5, line 22}.

Akram in view of Irving does not show removing residue on the semiconductor wafer after removing the photoresist layer using a downstream plasma process including hydrogen or deuterium and substantially no oxidizing component.

It would have been obvious to one of ordinary skill in the art at the time the invention was made, in light of the fact that the downstream plasma process of Irving, in the invention of Akram in view of Irving, removes all of the photoresist, any and all residues remaining from any impartial removal of the photoresist layer would also have been removed.

In re claims 4, 26, and 30, Irving shows wherein the downstream plasma process includes a gas mixture of which 60% to 100% of the gas mixture is made of hydrogen or deuterium {column 3, lines 11-14}.

In re claims 5 and 27, Irving teaches that the downstream plasma process may include gases such as any one of hydrogen and nitrogen {column 3, lines 11-14}. Irving also teaches that the temperature range required in removing the photoresist material while using nitrogen gas is in excess

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of 200 °C while the temperature range required in removing the photoresist material while using hydrogen gas is in the range between 100 ° and 120 °C {column 4, lines 9-21}.

Akram in view of Irving does not disclose wherein the removing the photoresist layer is performed in a temperature range of 245 ° to 350 °C.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to perform the downstream plasma photoresist removal process of Akram in view of Irving at a temperature range of 245 ° to 350 °C since, as evidenced by Irving, a combination of gases may be used and, with each different gas used, a different photoresist removal temperature range is appropriate. Thus, by applying a proper combination of downstream plasma photoresist removal gases, it would have been obvious to one of ordinary skill in the art to expect the discovery of a photoresist removal temperature within a range of 245 ° to 350 °C and the discovery of the optimum or workable ranges of a process temperature would have involved only routine skill in the art. Furthermore, the specification contains no disclosure of either the critical nature of the claimed process temperature or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen temperature ranges or upon another variable recited in a claim, the applicant must show that the particular temperature ranges are critical.

In re claims 6, 28, and 31, Irving shows wherein downstream plasma process further includes a gas made of argon, nitrogen, and any other inert gas {column 3, line 10 – column 4, line 38}.

Response to Arguments

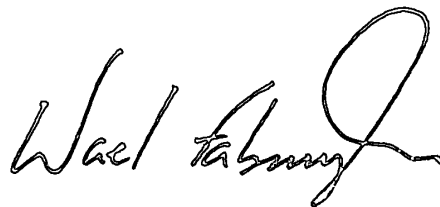
4. Applicant's arguments with respect to claims 1, 4-6, and 25-31 have been considered but are moot in view of the new ground(s) of rejection.

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Conclusion

5. Paper related to this application may be submitted directly to Art Unit 2823 by facsimile transmission. Papers should be faxed to Art Unit 2823 via the Art Unit 2823 Fax Center located in Crystal Plaza 4, room 4C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2823 Fax Center number is (703) 308-7722 or -7724. The Art Unit 2823 Fax Center is to be used only for papers related to Art Unit 2823 applications.

Any inquiry concerning this communication of earlier communication from the examiner should be directed to **Kurt Eaton** at (703) 305-0383 and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via kurt.eaton@uspto.gov.



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